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# ECONOMIC CONSIDERATIONS IN THE DEVELOPMENT OF AGRICULTURE IN VIETNAM

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ABSTRACT

This report summarizes a series of U.S. Department of Agriculture/U.S. Agency for International Development studies on the agricultural economy of Vietnam, highlighting implications for government policies. The studies appraised Vietnam's 5-Year Rural Economic Development Plan, studied demand-price relationships within agriculture and between agriculture and the national economy, determined production potentials and agriculture's response to changes in the economic climate generated by government leadership, and evaluated the marketing systems for various agricultural commodities. They determined that the equivalent of nearly a 60 percent domestic food production increase would be required between 1972 and 1980 to achieve a balance between food imports and exports, meet needs of a growing population, and be prepared for a possible demand for more food because of a small income gain. Domestic needs could be met by 1980 (with an exportable surplus) by using present cropland more intensively, reclaiming previously cultivated lands, expanding irrigated areas, and cultivating new lands. With appropriate government policies and intensive programs, exportable quantities could be achieved sooner, although substantial exports are highly unlikely soon. Rapid urbanization and potential exports mean that large amounts of public and private capital must be committed to improving and expanding the marketing system. Continuing economic analysis is also needed to appraise policy alternatives as the economy advances.

Key Words: S. Vietnam, economic analysis, agriculture, projections, sector analysis, developing country, technical assistance.

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## SUMMARY AND HIGHLIGHTS

This report summarizes a series of studies on the agricultural economy of Vietnam, highlighting implications for government policies. The studies were sponsored by the U.S. Agency for International Development and conducted by the Economic Research Service, U.S. Department of Agriculture, in cooperation with the Vietnam Ministry of Agriculture and Land Development. They were initiated in the summer of 1971 in conjunction with a review of the Vietnam 5-Year Rural Economic Development Plan, and explored:

1. The relationship between agriculture and the general economy, including an appraisal of demand and prices of farm products.
2. The production of agricultural products and the shifts in production associated with changes in the allocation of resources.
3. The marketing and processing of farm products, including possible markets abroad.

Several analytical techniques were used, including (1) an economic framework to study the agricultural and general economy interrelationships and (2) a linear programming model to determine optimum resource allocation.

The studies reveal important considerations in planning programs and policies to develop Vietnamese agriculture. Because agriculture is the largest industry in Vietnam, agricultural developments loom large in the current and projected levels of gross national product and are therefore important to the national economy. Other developments such as changes in tax rates, imports, savings, and exchange rates affect agriculture by shifting income levels, prices, and demand for farm products. Thus, effective planning for agriculture and the general economy must be a combined, coordinated effort.

Growth in population, per capita income, and urbanization all affect the demand for food and farm products as well as the supply. Current food consumption indicates that people in Vietnam eat about as well as people in neighboring countries. However, nearly one-fifth of this food has to be imported. To achieve a balance between imports and exports of food, meet the needs of a growing population, and be prepared for a possible demand for more food because of a small income gain would require the equivalent of nearly a 60 percent domestic food production increase from 1972 to 1980.

Increased yields on the existing area under cultivation could generate some of this required increase. But more land must also be brought into cultivation in the next few years to help satisfy domestic food needs. More intensive use of present cropland, reclamation of previously cultivated abandoned lands, and expansion of the irrigated area as well as tillage of new lands could satisfy domestic food requirements and generate an exportable net surplus of farm products by 1980. Exportable quantities could be achieved before 1980 with appropriate policies and intensive public and private programs. However, substantial exports in the near future are highly unlikely.

The rapid urban population growth means that more consumers are further from the food producer. More transportation, storage, and handling increases



marketing costs and requires a better organized marketing system. Large amounts of public and private capital must be committed to improving and expanding the current market system over the next few years in response to increased domestic demand and potential exports. To fully exploit these potential domestic and export markets, products should be required to meet at least minimum quality standards.

Vietnam's long-term agricultural goals should be considered when one interprets the analyses developed in these studies. For example, optimum resource allocation may be a long-term goal, but the path to this goal must shift from time to time because of constantly changing conditions, both foreign and domestic. This shifting path requires a specialized group of analysts who can report on the current and near-term supply and demand prospects. No one analysis of an economy can yield the answer, but such a continuing analysis should yield the insights and tools necessary to appraise and review policy alternatives as the economy moves toward its longer run goals.



# ECONOMIC CONSIDERATIONS IN THE DEVELOPMENT OF AGRICULTURE IN VIETNAM\*

## INTRODUCTION

In 1971, the Vietnam Ministry of Agriculture adopted a 5-Year Rural Economic Development Plan (RED Plan) which underscored the need for an expanded capability of economic analysis of agriculture as a basis for development planning. The Ministry relayed this need to the U.S. Agency for International Development (USAID). This stimulated an applied research project aimed at assembling data, developing analytical tools, and transferring these tools to a Directorate of Agricultural Economics in the Ministry to aid in planning agricultural development.

In cooperation with the Economic Research Service, U.S. Department of Agriculture, a four-part research program was developed. Part 1, completed in September 1971, called for an economic appraisal of the 5-Year RED Plan. Part 2, completed by September 1972, requested a study of demand-price relationships within the agriculture sector and between agriculture and the national economy. Part 3 called for a study of the agricultural production potential and the response from agriculture to changes in the economic climate as might be provided by government leadership. This study analyzed the potential production for the different regions of Vietnam and the distribution of this production to domestic and export markets. A first draft was completed by the end of 1972. Part 4 dealt with the marketing of agricultural commodities. Separate studies were completed in 1972 on poultry and eggs, swine, cereal grains, vegetables, sugar, oil crops, and transportation.

The professional staff assigned to the studies spent approximately half their time in Vietnam, working with counterparts in the Ministry of Agriculture to gather data and develop the methods of analysis.

The experience and judgment of Vietnam Government authorities--aided by economic data and analysis--must be the basis for agricultural development programs in Vietnam. Authorities may get valuable assistance by using models described in this report to test the impact of alternative policies or programs on agriculture. In the model dealing with agricultural production and farm income, for example, a change in program emphasis such as a decision to produce sugar may be introduced as an assumption. The results can then be used to evaluate whether the change in program emphasis is useful. Likewise, the model dealing with agriculture in the national economy can be used to relate changes in production to possible impacts on future demand and national income.

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\* This report was compiled from a series of U.S. Department of Agriculture/ U.S. Agency for International Development/Vietnam Ministry of Agriculture and Land Development studies (see list inside back cover). Preparing this summary and analysis were USDA Economic Research Service economists Bill Bolton, William A. Faught, Ray Fox, Robert G. Hoffman, and Frederick Nelson; Ernest J. Nesius, former Assistant Director, Agricultural Economics and Support Division, Office of Food and Agriculture, U.S. AID Mission to Vietnam, and now at West Virginia University; and M. L. Upchurch, former USDA Economic Research Service Administrator and presently at the University of Florida. William A. Faught coordinated the series of studies used to develop this summary.

Results from such tests, tempered by judgment and experience, will help officials select best alternatives. As more information is obtained, the data describing the agricultural economy can be improved, producing better results for program administrators.

Results from the current analysis are tentative in the sense that economic and production factors are continually changing in their relationships to each other. Thus, the agricultural policies and programs, within reasonable limits, must change also.

The report that follows is divided into two major sections. It is addressed to and is for use by the Vietnamese Government. The first part deals with the interrelationship of agriculture and the Vietnamese economy; the second part deals with supply response, production capacity, and optimum resource allocation.

## AGRICULTURE AND THE NATIONAL ECONOMY

### Agriculture's Importance in the Vietnamese Economy

Agriculture is South Vietnam's most important industry; its development is likely to be the keystone to the country's economic growth. The farm value of agricultural products represents more than one-third of the value of national production (gross national product). Furthermore, over half the population is rural. Agriculture is an integral part of the economy; it affects and is affected by general economic policies and economic developments within the country.

Increases in farm production have a major impact on gross national product (GNP); for example, an increase of 1 percent in rice production is associated with a short-run (within a year) increase in real gross national product of about 0.6 percent. <sup>1/</sup> Similar increases in livestock generate smaller, though important, impacts on GNP. Total investment, government expenditures, and total exports are major components of GNP; they directly influence levels of income and therefore demand and prices for agricultural products. However, because of the time lag in agricultural production decisions, changes in income or GNP usually require some time to be reflected in agricultural output. (Table 1)

Major economic indicators have shown diverse movements in recent years. Deflated (real) GNP in Vietnam increased at an average rate of 3 percent from 1964 to 1970--about matching population growth. Real household income (gross national product less gross business savings and taxes) increased at about the same rate. After a downtrend in production from 1964 to 1968, an intensive development program has pushed the index of crop and livestock production up

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<sup>1/</sup> Throughout this report, the statement "a \_\_\_\_ percent change is associated with a \_\_\_\_ percent change" summarizes, in narrative form, elasticities based on either time series analysis or cross section survey. Each statement is based on the "ceteris paribus" assumption (other things being equal or unchanged) while the specified change takes place.

Table 1.--Summary of relationships among selected economic variables

Item	: Change resulting from 10 percent increase in:									
	: Total	: Gov.	: Exports	: Rice	: Live-					
<u>1/</u>	: invest-	: expendi-	: <u>1/</u>	: Produc-	: stock					
	: ment 1/	: tures 1/	: <u>1/</u>	: tion 2/	: index 3/					
	: 1st	: Long:1st	: Long:1st	: Long:1st	: Long:1st	: Long:1st	: Long:1st	: Long:1st	: Long:1st	: Long:1st
	: year:run	: year:run	: year:run	: year:run	: year:run	: year:run	: year:run	: year:run	: year:run	: year:run
: - - - - - Percent - - - - -										
Nonfood consumption.....	: 0.8	: 0.9	: 1.7	: 1.8	: 0.4	: 0.5	: 3.6	: 2.2	: 0.7	: 1.2
Food consumption.....	: --	: .2	: --	: .3	: --	: .1	: 10.0	: 6.1	: 1.9	: 3.4
Imports.....	: -.4	: -.9	: -.9	: -1.0	: -.2	: -.2	: -1.9	: -1.2	: -.4	: -.7
Gross national product.....	: 1.2	: 1.3	: 2.5	: 2.7	: .6	: .7	: 5.5	: 3.4	: 1.0	: 1.9

-- = Not applicable.

1/ Real \$VN.

2/ Rice equivalent paddy production.

3/ Index of livestock production.

nearly 10 percent annually from 1968 to 1972. Because of these divergent trends, the total index increased only 1.5 percent annually from 1964 to 1970. Real gross domestic expenditure (GDE), the sum of consumer expenditures for food and nonfood items plus total investment and government expenditures, increased more than 8 percent per year. This was possible only with sharply increased imports--both food and nonfood items.

To close the gap between domestic consumption and domestic production, imports were increased at an annual rate of about 16 percent. In 1970, total imports of food and nonfood items equaled about one-fifth of GDE and one-fourth of GNP. In spite of large imports, price levels in 1970, measured by the consumer price index for working class families, were six times 1964 levels. The 1970 wholesale price of rice increased at an even faster rate to more than seven times the 1964 average.

Gross food expenditures have risen less rapidly than expenditures for nonfood items. Food expenditures have averaged about 40 percent of gross domestic consumption (food plus nonfood) in recent years compared with about one-half the total in the early 1960's. Imports and domestic income largely determine the demand for nonfood items. With both consumer income and import levels rising in recent years, nonfood items have accounted for an increasingly larger share of total expenditures.

#### Growth of Commercial Agriculture

Commercial marketings of farm products in Vietnam have traditionally been confined largely to rice and rubber. Rice marketings largely reflected sales



by landlords of rice collected as rent. Rubber was produced primarily on large plantations. Subsistence farmers, forming the major underpinning of agriculture, sold only limited quantities of produce to nearby population centers.

In such an economy a relatively simple type of marketing system was required because nearly four-fifths of the population lived in rural areas and little was required in marketing services. However, with increased urbanization, commercial markets have increased and may continue to grow. This growth, particularly if accompanied by expanding exports, would require more elaborate and effective marketing services.

### Production Adjustments to Price Change

A review of price and production data for the past decade indicates that farmers respond to changes in commodity prices. Farmers appear to relate current production plans to prices prevailing during the preceding season. However, their production response to price varies distinctly among commodities. For example, rice producers are less responsive to rice price changes than producers of most other agricultural products. An increase of 1 percent in the real price for rice is associated with an increase of about 0.15 percent in the area of rice planted during the first year following the change. In contrast, food crops other than paddy show a change of about 1.25 percent in production for each 1 percent change in real price. Staple foods, which make up a large share of the consumer diet, generally show a much lower supply response to price changes than the less widely grown crops. (Table 2)

Table 2.--Elasticity of supply: Changes in supply associated with a change in the price of selected commodities

Item	Change in supply with 1 percent increase in price	
	Short run 1/	Long run 2/
	Percent	
Paddy hectares:		
Delta.....	0.1 to 0.2	0.2 to 0.3
Other.....	0.2 to 0.3	3.0 to 4.0
Total 3/.....	0.1 to 0.2	0.4 to 0.7
Food crops other than paddy....	1.2 to 1.3	NA
Hog slaughter (controlled)....	0.5 to 1.0	NA
Fish catch.....	0.25 to 0.30	1.0 to 1.1

NA = Not available

1/ Short-run elasticity = (mean of item divided by mean of the item's price) times the regression coefficient of the item.

2/ Long-run elasticity = short-run elasticity divided by (1 minus the regression coefficient of the item lagged 1 year).

3/ Weighted average of Delta and other.

Livestock supply is generally more responsive to price changes than is the supply of staple crops, although livestock supply is somewhat less responsive than food crops other than paddy. Fish production requires relatively large capital inputs and may increase only about 0.3 percent for each 1 percent increase in real fish price in the short run. Over the longer run, <sup>2/</sup> with time to adjust boat numbers, the fish catch increases about 1 percent for each 1 percent increase in real price.

The urban population increased from about one-fifth to two-fifths of the total population between 1960 and 1970, creating a large market for farm products. The urban growth and the relative decline in rural population also have important implications for production, marketing, and consumer preferences, as well as national policies.

#### Demand Changes Related to Population, Price, and Income

Food consumption in Vietnam, measured in calories, compares favorably with that in several nearby countries. Estimates based on published data regarding the 1970 food supply and utilization in Vietnam show food consumption, including imports, at about 2,200 calories per person per day. Most of this food intake is cereals--about three-fourths of the total. Protein levels suggested by the intake of fish and meat appear comparable with most other Asian countries. (Table 3)

This review suggests that current food consumption, bolstered by imports, meets basic needs. However, future changes in relative prices and consumer incomes will cause shifts in demand for individual food items.

Although food prices and consumer incomes play important roles in determining consumption patterns and levels, the greatest impact on total demand results from growing population. A 1 percent increase in population will increase demand 1 percent. Additional effects on demand come from shifts from a rural to an urban population. Although the price and income effects are smaller than population effects, they can be influenced by policymakers and thereby provide a means of adjusting demand levels.

As in any commercial economy, volumes consumed by both urban and rural populations generally change substantially as a result of price changes. Demand for rice is less responsive to changes in real price than most other food items, reflecting its basic position in the diet. For the entire population, per capita disappearance (total use, both food and nonfood) shows a decrease of only about 0.2 percent in quantity with each 1 percent increase in real price. In contrast, rice consumption by the rural population is much more responsive to price changes, with a decrease of about 0.6 percent in consumption associated with a 1 percent increase in real rice price. Apparently rural nonfood demand for rice and paddy (primarily livestock feed demand) has a much higher elasticity

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<sup>2/</sup> That period when all adjustments in the economic system are assumed to have taken place.

Table 3.--Per capita calorie intake, Vietnam and selected countries

Food item	South Vietnam	Indonesia	Thailand	Malaysia	Japan	Taiwan
	Calories per day					
Cereals.....	1,654	1,063	1,605	1,248	1,397	1,504
Tubers.....	68	338	66	36	134	144
Sugar.....	76	72	119	280	197	154
Pulses, oilseeds etc. ....	28	122	130	110	146	100
Vegetables and miscellaneous....	7	13	20	20	90	36
Fruit.....	37	17	73	93	40	42
Meat.....	178	20	83	89	53	192
Eggs.....	6	3	15	12	38	9
Fish.....	54	20	48	40	85	52
Milk.....	18	1	17	52	62	11
Fats and oils.....	31	84	36	214	174	134
Miscellaneous.....	--	7	14	6	--	1
Total calories....	2,157	1,760	2,226	2,200	2,416	2,379

Source: South Vietnam estimates for 1970 from published crop estimates, summary of imported foods, and Economic Research Service estimates of livestock production and resulting supply and utilization tables. Remaining countries from FAO Food Balance Sheets, 1964-66.

of demand than the food use. Fish and food crops other than paddy show decreased consumption of about 0.4 percent with a 1 percent real price increase, while pork shows about 0.7 percent change. (Table 4)

Increases in household income generally increase the demand for all agricultural products (table 5). However, income changes affect demand for individual commodities differently. For example, a 2 percent gain in per capita real income could push per capita rice disappearance up more than

Table 4.--Price and income elasticities of demand for selected commodities

Item	Changes in use with 1 percent increase in:		
	Price deflated by Consumer Price Index	Income deflated by Con- sumer Price Index	Price or supply of competitive products
	Percent		
Rice (total).....	-0.2 to -0.3	0.25 to 0.35	0.2 to 0.3 <u>1/</u>
Rice (rural).....	-0.5 to -0.6	-0.1 to -0.15	0.2 to 0.3 <u>1/</u>
Fish (urban).....	-0.3 to -0.4	0.5 to 0.6	0.1 to 0.2 <u>2/</u>
Pork.....	-0.6 to -0.8	0.5 to 0.6	0.1 to 0.2 <u>3/</u>
Rubber.....	-0.35	1.5	Trend+10%
Food crops other than paddy.....	-0.3 to -0.4	1.0	--
Nonfood crops other than rubber.....	-0.2 to -0.5	0.1 to 0.2	--

1/ Index of livestock production.2/ Price of pork deflated by Consumer Price Index.3/ Price of rice deflated by Consumer Price Index.

Table 5.--Estimated growth in demand for selected commodities arising from assumed gains in household income and population in a 5-year period

Item	Income elasticity	Increased demand from:		
		Household income <u>1/</u>	Population 2/	Both sources
		Percent		
Rice.....	0.30	3	16	19
Fish.....	.55	6	16	22
Pork.....	.55	6	16	22
Other food crops <u>3/</u> .....	1.00	10	16	26
Total food.....	.75	8	16	24
Rubber.....	1.50	16	16	<u>4/</u> 32
Other nonfood crops <u>5/</u> .....	.15	2	16	18

1/ Household income assumed to increase 2 percent per capita annually.2/ Population assumed to increase 3 percent annually.3/ All food crops excluding rice.4/ Does not include trend shown in Table 4.5/ All nonfoods, excluding rubber.



1 kilogram in any year ( $2 \text{ percent} \times 0.30 = 0.6 \times 200 \text{ kg. per capita} = 1.2 \text{ kg. per capita}$ )--about one-half of 1 percent. Income changes have much greater impacts on food crops other than rice, with a 2 percent gain in real income associated with about a 2 percent gain in demand. Pork and urban fish consumption, however, would probably move only about 1 percent with the same income gain.

A recent expenditure survey of urban dwellers summarized by income levels provides much greater detail for individual products than results from the analysis of data for the decade of the 1960's, discussed above. It also provides a basis for comparing the relative preference for different products.

Analysis of the survey data shows that consumption of cereals (including rice), fish, fresh vegetables, and edible oils changes relatively little with changes in income. These are the staple foods. As incomes increase, consumers show a clear preference for poultry over pork and, in turn, for pork over fish. The demand for fresh fruits increases with increases in income, especially for consumers in the higher income brackets (table 6). These data suggest that, if real household income grows 2 percent a year (about 10 percent in a 5-year period), the composition of urban diets would change and the demand for all food would increase about 7 to 8 percent on a per capita basis. The largest gains in demand would be for meals eaten away from the home. Much smaller increases in demand would occur for such individual food items as pork, poultry, fresh fruit, and fish, but the sum for several of these foods (such as pork, poultry, and fish) would exceed that for eating out, which includes all foods. The largest percentage increases, although not total increases, would occur for soft drinks and alcoholic beverages (table 7).

Even though changes in income affect demand for food, much greater effects come from changes in population. If population continues to grow at about the current rate of 3 percent a year, 16 percent more people must be fed each 5 year period. The demand for all farm products would increase proportionately. If this larger population also had higher incomes, the demand for food would increase even more. The increase would differ for different foods, depending on consumer preference.

The elasticities are computed from cross-section data summarized in five income groups. These groups were then divided into two overlapping expenditure groups--a low expenditure group (under VN\$300,000) and a high expenditure group (over VN\$200,000).

The combined effects of income increases and population growth can increase total food demand substantially, particularly if real prices remain stable. Again, assuming a 2 percent annual growth in per capita real income and a 3 percent annual population gain, total food demand could increase by nearly one-fourth every 5 years.

Substantial quantities of food are already being imported. Therefore, to meet the growth in demand for food noted above and to offset the current levels of imports, domestic food production must expand nearly 60 percent between 1972 and 1980. However, before reaching this level of self-sufficiency in food, Vietnam may possibly export some food products in which it has a production advantage while continuing to import other products.

Table 6.--Per capita expenditure elasticities for high and low household expenditure groups 1/

Item	All Vietnam			Saigon		
	Under	Over	All	Under	Over	All
	:300,000:	:200,000:	groups	:300,000:	:200,000:	groups
	: VN\$	: VN\$		: VN\$	: VN\$	
All food.....	.825	.655	.741	.862	.811	.830
Lower elasticity staple foods:						
Cereals & products.....	.320	.186	.223	.321	.243	.260
Fish.....	.456	.328	.375	.539	.453	.472
Fresh vegetables.....	.470	.295	.380	.255	.420	.347
Edible oils.....	.354	.215	.255	.168	.306	.212
Moderate elasticity foods:						
Pork.....	.970	.815	.895	1.186	.902	1.008
Milk and eggs.....	.791	.570	.682	.452	.656	.583
Coffee.....	.636	.434	.558	1.651	.792	1.036
High elasticity, preferred foods:						
Beef.....	1.677	.704	1.122	2.990	.869	1.615
Other meats.....	2.427	.906	1.622	2.278	1.543	1.719
Poultry.....	2.792	1.640	2.282	2.971	1.845	2.489
Fresh fruit.....	1.450	.877	1.738	.974	2.646	2.129
Sugar products.....	1.422	1.654	1.550	1.547	2.291	2.121
Eating out.....	1.854	.732	1.239	1.395	.507	.839
Soft drinks.....	3.290	2.345	2.802	2.455	2.626	3.183
Alcoholic beverages.....	1.879	2.466	2.089	4.454	4.039	4.201
Clothing.....	2.138	1.630	1.840	2.309	1.804	2.106
Utilities.....	3.957	2.997	3.738	.896	2.650	2.766
Household equipment.....	.818	1.453	1.150	.816	1.308	1.042
Miscellaneous services.....	1.694	1.420	1.503	1.515	1.031	1.230

1/ The NIS survey of household expenditures (annual expenditures in piasters) in 1969-70. Footnote 1, page 2, generally defines elasticity. More specifically, the elasticities in this table were computed on the basis of a double log relationship ( $\log E_f = a + b \log E$ ). The elasticities (b values) show the percent change in cost of living items with a 1.0 percent change in per capita total expenditure (income).

Table 7.--Vietnam urban family consumption 1969-70 and projections to 1977

Item	Annual	Expenditure	Projected annual	
	per capita outlays	elasticity <u>1/</u>	expenditure, 1977 <u>2/</u>	Per capita : Increase
	<u>Piasters</u>		<u>Piasters</u>	<u>Percent</u>
Total per capita				
expenditures.....	44,259	1.0	50,900	15
Food <u>3/</u> .....	26,951	.741	29,950	11
Cereals and				
products.....	4,740	.223	<u>4/</u> 4,850	2
Beef.....	1,014	1.122	1,175	16
Pork.....	3,615	.895	4,065	12
Other meats.....	79	1.622	95	20
Poultry.....	1,210	2.282	1,610	33
Fish.....	4,100	.375	4,290	5
Milk and eggs...	1,020	.682	1,115	9
Fresh fruit.....	1,085	1.738	1,355	25
Fresh				
vegetables.....	2,500	.380	2,620	5
Edible oils.....	1,135	.255	1,170	3
Sugar products...	620	1.550	755	22
Coffee.....	265	.558	280	6
Soft drinks.....	113	2.802	160	42
Alcoholic				
beverages.....	385	2.089	500	30
Eating out.....	4,945	1.239	5,810	17

1/ Elasticity is defined in footnote 1, page 2.

2/ Assuming real household expenditures increase 2 percent per year, 1970 to 1977 would equal about 15 percent. Projected per capita piasters are in terms of 1969-70 price level.

3/ Total does not include small amount of home food production.

4/ Projected individual food expenditure items adjusted slightly to equal total for food less home food production.

INDICATED EFFECTS ON THE GENERAL ECONOMY  
OF INCREASES IN AGRICULTURAL PRODUCTION

The interaction of complex economic forces will determine the development of agriculture. Effects of these forces must be considered in making policy decisions for development. The problem is to systematically evaluate their net effects under alternative policies that might be considered. The analytical system that has been developed, and the measures of relationships presented, provide an aid to policy and program formulation. Although the data series on which these analyses were based were not fully adequate and some were of questionable accuracy, the results are consistent with results recorded in other countries as well as with established economic principles. Therefore, the results appear useful in assessing policy alternatives and indicating guidelines for implementation.

To illustrate a use of the analysis developed, an evaluation has been made of the possible effects on the general economy of five resource development situations. These results, in combination with several basic assumptions, provide the basis for a more complete evaluation of the resource development alternatives.

The five land resource situations are defined as follows:

- I. "Existing"--Cropland currently in use in 1971.
- II. "Historical"--Resource base I, plus land abandoned in recent years.
- III. "Salt intrusion"--Resource base II, plus Delta land reclaimed by salt intrusion improvements.
- IV. "Irrigation"--Resource base III, plus additional land irrigated with existing irrigation technology.
- V. "Additional"--Resource base IV, plus previously unused land that could be brought into cultivation.

The analysis of each of the resource situations suggests strikingly different effects on the general economy by 1980. By relating production and other important economic assumptions from each of the five land resource situations (table 8) to a specific date (1980), the annual effects on gross national product and gross expenditures can be approximated (table 9). The real compound rates of change assumed or estimated are indicated in the tables. With the assumptions specified, this analysis suggests that:

1. If utilization of land resources is restricted to the area now in cultivation (land resource situation I), production increases would be limited to those attainable through increased yields. While this increase could be substantial--total production up about 15 percent from 1972--it will not provide sufficient impetus to the general economy to generate significant increases in real per capita GNP, assuming population grows at a 3 percent rate.



Table 8.--Annual change in selected major economic factors under five land resource situations 1/

Item	1972 base					Percent				
	Value	Unit	I	II	III	Salt:	IV	V		
			Existing:	Historical:	in:	trusion:	Irrigation:	Additional		
Investment.....	12.0	2/1960 \$VN	2.5	10.1	11.3		11.9		26.7	
Exports.....	6.0	2/do.	1.4	4.0	5.2		7.0		21.5	
Imports.....	70.0	2/do.	-2.8	-6.9	-7.8		-7.8		-8.6	
Grain 3/.....	3,600	1,000 M.T.	1.9	3.7	4.1		4.3		7.3	
Livestock 4/.....	154	1957-59=100	-1.5	0.2	1.0		1.1		1.5	

1/ Assumed predetermined compound annual percent change from 1972. Model solutions under each land resource situation are assumed to have made all adjustments by 1980.

2/ Estimates of USDA/AID team reported in Agriculture in the Vietnam Economy: A System for Economic Analysis, FDD Field Report 32, Economic Research Service, U.S. Department of Agriculture cooperating with U.S. Agency for International Development.

3/ Rice equivalent (feed value basis) of total paddy, corn, and sorghum production.

4/ Livestock production index.

Table 9.--Indicated real growth rates in selected major economic factors under five land resource situations 1/

Item	1972 base <u>2/</u>	I Existing	II Historical	III Salt intrusion	IV Irrigation	V Additional
	1960 \$VN			Percent		
Gross National Product.....	131.2	3.2	6.7	7.4	7.7	13.5
Gross Domestic Expenditure.....	192.7	1.3	3.2	3.6	3.8	8.3
Food expenditure.....	39.9	2.8	5.0	5.5	5.8	8.7
Nonfood expenditure.....	60.8	1.7	4.0	4.4	4.7	9.5

1/ Compound annual change from 1972 to 1980 based on ERS Econometric Framework using the agricultural production data from the production-distribution model as inputs (see table 8). Household income (real) is assumed to grow at 3 percent per year, and rice prices are held constant under each situation.

2/ Estimates of USDA/AID team reported in Agriculture in the Vietnam Economy: A System for Economic Analysis, FDD Field Report 32, Economic Research Service, U.S. Department of Agriculture cooperating with U.S. Agency for International Development.

2. If land utilization is increased by reclaiming abandoned land, construction of salt intrusion barriers and/or construction of modest irrigation facilities (land resource situations II, III, and IV), agricultural production could be increased significantly. Under these resource bases, GNP would likely increase significantly over situation I. Consumer expenditures for food as well as nonfood items would also increase.
3. If the land resource base is expanded even more--which is clearly feasible by development of some of the presently unused lands (land resource situation V)--the associated agricultural production increase could result in a sharply increased rate of change in GNP along with similar increases in consumption expenditures, over the other situations.
4. Increases in the general economy arising from an increase in farm production bring clearly into focus the relationship between growth in domestic consumption and possible export potential. With increases in GNP, consumer incomes would also increase and, if unchecked, would increase demand. Such demand increases would then reduce supplies available for export.
5. This probable course of events suggests the need for considering alternative means of containing the increased income effects in order that the export potential not be eliminated. Otherwise, the flow of foreign exchange needed for development would be curtailed and the development thrust halted.
6. Alternative courses of action might include measures to drain off all or at least a portion of the increased per capita income through taxes or increased savings, price policies to effectively raise domestic prices and thereby restrict purchases, or some combination of these policies or programs.

#### IMPLICATIONS OF INTERRELATIONSHIPS BETWEEN AGRICULTURAL SECTOR AND NATIONAL ECONOMY

##### Agriculture and the National Economy

--Increases in crops and livestock production are generally associated with significant increases in gross national product.

--Gross national product less taxes and savings determines household income (an approximation of consumer income). Consumer income, in turn, directly influences the demand for agricultural commodities and their associated product prices.

--Gross domestic expenditures, a measure of domestic economic activity, grew much more rapidly from 1964 to 1970 than gross national product because a gap between domestic consumption and production was filled by imports.



--Food production must increase by over 40 percent from 1972 to 1980 to match population growth and to offset food imports. In addition, if per capita real incomes grow 2 percent a year, nearly another 17 percent increase in total food demand could result. The total effect, then, could be a food demand expansion of nearly 60 percent by 1980.

#### Production Response in Agriculture

--Paddy supplies adjust sluggishly to changes in prices--a 10 percent increase in real prices may push up paddy hectares only 1 to 2 percent.

--Short-term paddy supply prospects indicate the need for continued emphasis on increasing the area of high-yielding varieties. But public programs are probably required to expand the total production area in the longer run.

--Supplies of food crops other than paddy are sensitive to price changes.

--Although fish production is more responsive to price change than rice, hog production is still more responsive than fish but less than food crops other than rice.

#### Demand Factors

--On the basis of calorie intake, Vietnam's current total food consumption level (nearly three-fourths cereals) is comparable to nearby countries. However, much of this intake relied on imported foods.

--Population size and the rural/urban mix have important effects on demand for food. For example, changes in the urban population have a greater impact on rice prices than equal changes in the rural population.

--Increases in the real income of urban people are associated with increases in rice demand. However, as incomes of rural people increase, their demand for rice may change little.

--Fish and pork demand is more responsive to real income changes than rice demand, although less responsive than other food crops. Demand for chicken is highly responsive to income gains.

--Fish and pork demand is more responsive to real price changes than rice demand. The demand relative to price of other food crops is similar to fish.

#### AGRICULTURAL DEVELOPMENT POTENTIAL

In the fall 1971 discussions in Saigon, when the 5-Year Rural Development Plan was being reviewed and considered, Ministry and USAID officials agreed that an analysis to indicate the optimum use of Vietnam's agricultural resources would aid further economic development planning. They recognized that this analysis should be concerned not only with identifying the optimum use and commodity mix for each resource situation but also the requirements for market

facilities to handle increased supplies. Further, the analysis should determine the impact of the various alternatives on foreign exchange and capital requirements.

The analysis was conducted within the framework of a model designed to reflect the optimum economic performance of Vietnam's agriculture at specified levels of resource use. Considerable effort was expended on defining and quantifying the existing agricultural land resource base in terms that reflect realistic productive potentials for its various components. Further major efforts were devoted to specifying and quantifying, in a similar manner, other potential agricultural land resource bases that reflect various alternative approaches to expanding the land resource. Model solutions, which yield information on effects of change on income, trade balance, internal capital requirements, land use and production patterns, and many other variables, were obtained for the various agricultural land resource bases under a variety of imposed conditions.

The planning period was 9 years, with production adjustments and expansion considered attainable by 1980. Farmers are expected to attain the production levels indicated by 1980 if necessary inputs are available at reasonable prices, land to be reclaimed or developed can be made available without undue delay, and marketing facilities are developed to handle their product and return them a reasonable price. The analysis reflects no major programs to accelerate the development process. However, the development process can be speeded up and the indicated production levels attained well before 1980 if programs to accelerate development are undertaken. If such programs are initiated, consideration should be given both to accelerating the rate of adoption of new technology (thereby increasing yields) and to expanding the resource base.

Yields used in the analysis do not indicate the maximum yields that could be attained by 1980. Effective education and demonstration programs and measures to assure availability of inputs would help farmers attain the indicated levels sooner.

Labor was assumed not to be a limiting factor and, in line with the general philosophy underlying the Land-to-the-Tiller program, the family-operated farm was assumed to be the basic production unit. However, hired labor was assumed to be available for use on larger farms on existing cropland. New lands were assumed to be cleared by family labor, with no capital inputs required.

New roads would be constructed by the government, as necessary, in areas where new lands are opened. Costs for such improvements are not included in the analysis.

Population was assumed to grow at an annual rate of 3 percent.

Per capita utilization of agricultural commodities was assumed to be maintained at about recent levels. This tacitly assumes, of course, that prices and incomes would also be continued at recent levels.

Several additional assumptions used in the analysis are detailed in the full report ("Production Capacity and Supply Response in Vietnam Agriculture:

An Application of an Economic Research Service Production-Distribution Model for Vietnam," Economic Research Service, U.S. Department of Agriculture, cooperating with Vietnam Ministry of Agriculture and Land Development and the U.S. Agency for International Development). However, they are of lesser importance and have less implication for future development than the ones noted above.

### Current Resource Use

About 2.4 million cadastral hectares were cultivated in 1971, representing a decline of around 600,000 hectares from a high in the early 1960's. This decline resulted from security deterioration and related reasons. Use of purchased farm inputs associated with improved cultural and husbandry practices, now at an all-time high, has reversed the decline in agricultural outputs.

The rural labor force, some of which was surplus, has declined in quantity and quality with mobilization and urbanization. The relatively small farm units of the recent "Land-to-the-Tiller" program have essentially institutionalized the family as the prime source of farm labor.

### Optimum Resource Use

The primary objective of the analysis discussed in this section was to determine the optimum utilization of agricultural resources. A linear programming agricultural production/distribution model was developed; land resource areas were delineated by soil types and geographical location; adaptability of various crops to these delineations was determined; and a derived price structure for agricultural inputs and products was developed. The prices were based on procurement of agricultural commodities and inputs from a foreign source, and reflect price relationships of the past 15 years. These prices were converted to piasters at a rate of 400 per U.S. dollar.

The primary analysis estimated how agricultural resources should be used to maximize farm income. Maximum incomes and cropping situations were calculated at five different levels of land resource use. These five resource situations were described in detail in the preceding section on page 11. In this section, only three of these resource situations (I, II, and V) will be discussed.

### Land Use

Rice is the dominant crop in the Delta and, to a lesser degree, in all other regions of Vietnam. Under resource situation II, most historical land would return to rice production in the Delta and Eastern Regions. Sorghum, peanuts, and corn as a group show a much higher area increase than does rice in the Coastal and Highland Regions. Rubber area increases about 22 percent in the Eastern Region. As new lands are brought into production--an increase of 1.2 million hectares (resource situation V)--the area in corn, soybeans, and peanuts increases considerably. Most of the corn area increase is in the Eastern Region, soybeans in the Highland, and peanuts in all regions but the Delta.



## Agricultural Income

A more intensive use of current cropland (resource situation I) would, by 1980, increase annual agricultural income about 25 percent over 1970. The greater use of improved crop varieties, fertilizer, and pesticides would increase average national yields substantially for rice, corn, peanuts, rubber, and tobacco.

Adding the 529,000 hectares of abandoned cropland (resource situation II) would increase agricultural income an additional 14 percent as abandoned lands are brought back into production. Adding 1.2 million hectares of new land and reclaimed salt water intruded lands increases agricultural income another 20 percent for a total of 37 percent over that derived from the current cropland base.

## Trade Balance

With only present cropland (land resource situation I) in use, significant imports of rice, soybean meal and oil, flour, sugar, and some meat products are estimated for 1980. Exports would include rubber, bananas, small quantities of coffee, and traditional amounts of duck feathers. The annual net trade position of the agricultural sector, including imports of production input, would be minus VN\$101.9 billion (table 10). In addition, one-time capital inputs would require VN\$14.7 billion in foreign exchange. Addition of abandoned land (resource situation II) would reduce the annual trade deficit by about half. Rice imports would no longer be required. However, one-time capital inputs of foreign exchange would require an additional VN\$14.5 billion over resource situation I requirements of VN\$14.7 billion.

Table 10.--Vietnam: Agricultural income, capital input requirements, and annual trade balance for three land resource situations

Item	Resource situation		
	I	II	V
	Existing	Historical	Additional
	VN\$ billion		
Gross product resulting from agriculture.....	271.6	309.9	371.5
Capital inputs:			
Domestic source.....	11.9	18.1	50.3
Foreign source <u>1/</u> .....	14.7	29.2	94.5
Annual trade balance <u>2/</u> .....	-101.9	-51.1	59.3

1/ Piaster equivalent of foreign exchange requirements at VN\$400 to US\$1.

2/ Does not include capital inputs. Negative figures indicate larger imports than exports.

Production under resource situation V would eliminate the annual agricultural sector trade deficit and would result in net annual foreign exchange earnings of VN\$59.3 billion. Additional one-time foreign exchange needs for capital inputs would be VN\$65.3 billion compared to land resource situation I requirements. This shift would increase annual agricultural income by VN\$99.9 billion from a base of VN\$271.6 billion. Rice and rubber exports would increase substantially. Corn, peanuts, sorghum, soybeans, and vegetable oils would attain an exportable surplus position.

### Marketing Agricultural Products

Rural to urban population shifts have increased the demand for agricultural commodities in the urban areas. This trend is expected to continue. Costs of assembly, transportation, storage, processing, and distribution facilities required to meet the increased market services are reflected in the difference, or spread, between farm and retail prices. As the level of services increases, so will the marketing margins. Channeling production to specific markets will also require functions such as standardization, grading, and market news, but these are generally public services and do not add directly to marketing costs.

Marketing margins are relatively small in Vietnam, reflecting the low level of services provided in the marketing process. For example, the farmer's share is estimated at about 75 percent of the retail rice price and about 80 percent of the retail egg price. However, marketing margins for highly perishable goods such as vegetables are relatively high, reflecting high losses incurred during transportation. While increased services may add to the marketing margin, increased efficiency in the marketing channel (such as reducing losses) helps reduce the margin.

The transportation system plays a vital role in moving farm products from producer to consumer. Current modes of transportation include the Delta canal and waterway system, roads, and the railway. Because of the war, the waterways and the railroad system have fallen into disrepair, causing more products to be transported by truck at a higher cost. Some freight costs could be lowered again if the canal systems were cleared and dredged so barges could be used. As regional specialization and commercialization increase, coastal steamers could provide low-cost transportation for semi-perishable commodities and other freight where time in transit is not critical.

With security improvement, the railroad system could also be brought back into use with minimum investment. This would provide a much needed service along the coastal areas of Vietnam from Saigon to Hue, at least for the medium term.

Holding foodstuffs in storage can occur at any point in the marketing channel. A system of relatively low interest loans for grain or other staple commodities, using the crop as security, could aid in distributing the volume of marketing throughout the year and provide producers an alternative to selling at low harvest prices.

The private sector is expected to continue providing most of the marketing services required for the increasing volume of farm products entering commercial marketing channels. Exceptions may be marketing services for new commodities or new forms of commodities not previously marketed in an area. Even new facilities could be provided by the private sector. Competitive returns for capital invested in marketing facilities have been reflected in the analysis.

If these facilities are not available, producers will face prices which are not conducive to increased production. Therefore, if the private sector does not provide adequate services and facilities, government intervention may be necessary. This intervention might be in the form of assistance to private firms through low interest loans, favorable tax rates, or assistance in solving technical problems. If these measures fail, a government agency may have to actively participate in the marketing process.

Capital investment requirements to process the increased agricultural output from the existing cropland base were computed at VN\$16.2 billion (table 11). Slightly more than half the investment would be to increase the capacity for processing industrial crops, three-quarters of which is rubber. Agricultural production increases from adding new and reclaimed land (resource situation V) would require an additional capital investment of VN\$38.6 billion. Out of this total, VN\$28.7 billion would be required to purchase grain processing facilities.

Table 11.--Vietnam: New processing facilities required for three land resource bases by 1980

Item	Land resource situation		
	I	II	V
	VN\$ billion		
Grain processing.....	7.0	12.6	35.7
Oilseed and feed mills.....	2.3	3.4	6.2
Industrial crop processing <u>1/</u> .....	6.9	9.3	12.9
Total.....	16.2	25.3	54.8

1/ Does not include banana marketing.

### Government Participation

Effective market operation requires the free flow of timely information throughout the marketing channel. Government can provide this function by establishing commodity grades and standards. Price quotations based on grades understood by every party in the marketing channel could aid marketing efficiency by channeling a specific quality and quantity of goods to a specific demand, such as the export market.



Establishing a market news system which quotes the grade, quantity, and price of the commodity being traded would provide a means for communicating market information to all market participants. This important function is a continuous process and needs to be supported by educational and training programs which determine the information needs and develop the criteria for communicating unbiased, timely market information.

## Adjustments

### Rice

Area planted to high-yielding rice varieties (HYV) would increase in each of the situations analyzed. However, Vietnam would not quite attain rice self-sufficiency by 1980 simply by continuing to increase the area under HYV; self-sufficiency is achieved only when the historic land base is brought into production (resource situation II). Significant exports (540,000 metric tons) are attained only by putting new lands into production (resource situation V).

When Vietnam moves from a deficit to surplus trade position, the price farmers receive for rice will, of course, decline. The amount of the decline reflects the difference between (1) the price of rice purchased at the cheapest foreign source plus transfer costs to wholesalers in Vietnam, and (2) the price in the nearest foreign market minus transfer costs of moving the rice to that market. The decline in price to farmers had little impact on agricultural production patterns.

To provide some idea of the sensitivity of rice production to price variations, prices were reduced 10 percent (below the export price) and probable effects observed when the new and reclaimed lands were being utilized (resource situation V). Total paddy production decreased by 67,000 M.T. (metric tons) with very little impact on cropping patterns. With an additional 10 percent reduction in rice prices (to 20 percent below the export level), paddy production declined 641,000 M.T. from a total of 7.7 million M.T. The major production impact was a shift from high-yielding to traditional rice varieties; there was little effect on cropping patterns in general.

Expanding rice production will require a number of adjustments in marketing, particularly in facilities. For example, increasing production through better use of existing cropland would require an increase in annual rice milling capacity of 45,000 M.T. Returning abandoned land to production would require an additional capacity of 106,000 M.T. (or a total capacity of 151,000 M.T.). Only a slight increase in milling capacity would then be required to bring new and reclaimed land into production (resource situation V).

About one-fourth of Vietnam's rice production moves off-farm. Shipping from the Delta to deficit areas requires assembly points for pooling the production of small producers. The projected increase in rice and/or grain production would require additional assembly facilities. A shift from bag-to bulk-handling of grains at key locations may be desirable as Vietnam achieves an exportable surplus. Milling facilities would also have to be upgraded to meet foreign market quality standards. Establishment of a market news service,



together with quality standards for all commodities, would also benefit both farmers and traders.

## Rubber

Because rubber production is relatively profitable, it was assumed that the rubber area could expand to the highest level of the past in land resource situations I and II. Removing this imposed constraint would likely result in additional rubber trees being planted on soil types adapted to rubber production, since rubber produces greater returns than all alternative crops on these soils. Therefore, in the model, rubber was brought into production on family farm units of 10 hectares each in land resource situation V. Area planted to rubber expanded 58,300 hectares, of which 55,800 was located in the Eastern Region and the remaining increase in the Highland Region.

Moving from the existing land resource situation to situation II would require an increase in annual processing capacity of 30,400 M.T., requiring capital investments of VN\$1.946 billion. Processing the increased production resulting under land resource situation V would require an additional increase in capacity of 44,600 M.T. annually, costing VN\$2.854 billion. Annual rubber exports would increase by 30,500 M.T., moving from land resource situation I to situation II; these would further increase 44,600 M.T. under land resource situation V, to a total of 233,200 M.T.

In a further analysis, prices were reduced 10 and 20 percent below the export price used in the optimal solution and applied to land resource situations II and V. In land resource situation II, area and production remained the same, but agricultural income and the annual trade balance each declined about VN\$2.7 billion with each 10 percent reduction in price. In land resource situation V, area and production remained constant with the first 10 percent price decrease. A reduction of 5,300 hectares, all on new land resources, came with the second 10 percent decrease in price. Rubber exports remained constant for the first price reduction, but declined by 43,600 M.T. with the second 10 percent price reduction.

Even at current low world rubber prices, rubber is the most profitable crop that can be grown on soils adapted to its production. A substantial reduction in rubber prices is necessary to cause significant shifts to other crops. This implies that a concentrated effort should be made to increase rubber production since all the increase would be exported without very much influence on the world rubber price. At least a substantial portion of the increase could be on small, individually-owned farms.

## Livestock

Livestock production on family farms was restrained in the analysis to a level which could be handled by the family in the traditional manner. Livestock on large-scale commercial units did not increase markedly under any of the situations. Therefore, some livestock product imports are indicated for all three land resource situations.

There is very little change in the distribution of livestock production among regions, regardless of the resource situation assumed. Some shift to pork production occurs in the Eastern and Highland Regions under resource situation V, reflecting increased feed production. Beef production increases in the Eastern and Highland Regions as a result of increased numbers of work stock. The absence of shifts into greater livestock production with increased availability of grains for feed apparently stems from a complex of problems involving high transportation costs and high production costs for commercial livestock enterprises. It was assumed that home livestock enterprises would not increase more than 60 percent above the base period, and that exports for each livestock commodity could not exceed 5,000 M.T. This maximum limit was achieved only by pork, and only after the irrigation resource base was implemented. A significant increase in exports would be possible under the additional land resource base situation if health and quality standards were appropriately improved and markets were available.

Timing the marketing of swine and poultry within a given marketing area becomes an important consideration as producing units increase in size. It is costly to producers to hold animals on feed after suitable market weights have been achieved. A combination of contract production and adequate storage and processing facilities would assist in leveling out the fluctuations in farm marketings (i.e., the amount of meat available to the consumer).

#### Feed Grain

Feed grain production (sorghum and corn) increases from 0.5 million M.T. to 2.4 million M.T. moving to resource situation V. Because of the small growth in livestock production, total feed demand (including paddy) increases only about 150,000 M.T. Corn production increases from 57,300 M.T. to 1.8 million M.T. A significant shift occurs between the amount of paddy and corn fed. However, because of the small livestock increase, 1.1 million M.T. of corn are available for export.

Sorghum area is estimated to be 178,000 hectares in the Delta. The area remains constant regardless of which land resource situation is considered because the sorghum grows on floating rice areas with residual soil moisture. It was assumed that there is no competition for this land from other crops during the dry season, so sorghum would be produced even with low projected yields. Other areas could produce an additional 174,600 hectares of sorghum, with little change indicated as one moves from one resource situation to another.

Protein concentrates would still need to be imported if only the existing land base is utilized. However, as new and reclaimed land is brought into production, these imports discontinue. Soybean and peanut production increases significantly, with 273,000 M.T. available for export. Vegetable oils also move into a surplus position in conjunction with supplying the feed industry with protein concentrates. High processing and marketing costs for oil crops appear to be the major factor limiting vegetable oil production specifically for export. If a viable oilseed processing industry were to develop, a decision would have to be made to terminate refined vegetable oil and oilseed meal imports under preferential circumstances.

Investments for threshing and shelling machines would require VN\$1.9 billion for resource situation I and an additional VN\$9 billion moving to resource situation V.

### Sugar

Sugarcane appears on a limited area in the historical land base, and no significant increase occurs until new lands are brought into production. These new lands are areas where sugarcane has not been traditionally produced. This introduces uncertainty, and a sugarcane production project may be required if production is to expand significantly.

Under resource situation V, 88,500 hectares are used for sugarcane production. These provide about 85 percent of the domestic sugar requirements. Capital investment needed for the additional milling capacity to process the increased production would be about VN\$27.7 billion.

### Bananas

Bananas are primarily produced in the Eastern Region under all land resource situations. Production occurs in all cases to the point of meeting the arbitrarily selected export requirement of 200,000 M.T., but would increase if larger exports were assumed possible. Bananas are produced on only 8,900 hectares, so even a substantial increase in production would have very little impact on cropping patterns. Appropriate varieties, quality, and marketing facilities are mandatory if bananas are to be exported, however.

### Wheat and Cotton

Although Vietnamese farmers have little experience with wheat and cotton, information on production of these crops under similar conditions elsewhere indicates that they should be tested. Successful cotton production appears to be possible in a relatively short period. Wheat, on the other hand, may require several years of adaptive research.

### Traction Power

It was assumed that increased power requirements could be met by importing either tractors or livestock. All solutions call for importing cattle in preference to tractors. Adding abandoned land to the existing cropland would mean importing 24,300 head of work cattle. Addition of other reclaimed and new land would mean importing 62,300 more head. Cattle imported for power represent a one-time foreign exchange requirement. They increase by natural process and supply beef as a byproduct.

If only tractors could be imported to meet increased traction power requirements, agricultural income from the maximum resource base analyzed would be reduced VN\$8.1 billion compared with the situation where cattle would be imported. The annual trade balance would be decreased by VN\$8.3 billion.



Capital investment would increase by VN\$15.5 billion, of which VN\$9.7 billion would be foreign exchange. Some crop production pattern shifts would also occur. Some rice land would move from the improved floating varieties to double transplant, traditional rice, and there is a substantial shift from soybeans to corn in the Highland Region.

The impact indicated here is conservative. The analysis assumed one tractor per 100 hectares, reflecting current tractor use as reported by custom operators. A more probable tractor/land ratio would be one tractor per 50 hectares, especially as additional lands are brought into use (which does not generally include any increase in paddy cultivation).

### IMPLICATIONS

Within the constraints of the existing land resource base, Vietnam cannot achieve or maintain self-sufficiency in both rice and livestock production. Either rice, livestock feed, livestock products, or some combination of these will have to be imported. A large trade deficit will exist even with optimum use of resources and with currently attainable increases in productivity. Major emphasis must necessarily be devoted to efforts to further increase rice production.

Available land resources simply will not permit substantial expansion of crops such as oilseeds and feed grains. Adjustments that are suggested by the model, with this land resource situation, very likely will not occur because of the lack of markets and the small size of farms in regions where changes are indicated. Resource situation I implies major programs to:

1. Insure an adequate supply of inputs at reasonable cost, facilitate pump purchases for water control and irrigation, and stimulate the production of high-yielding rice varieties on all suitable land.
2. Implement price policies favorable to maximum recovery of latex from tappable rubber trees.
3. Intensify efforts to develop banana production for export to the extent that markets can be obtained.
4. Intensify efforts to develop feed grain production as a supplemental crop in the floating rice area. This implies establishment of a reliable marketing system for the grain and availability of threshing facilities.

Returning abandoned cropland to the land resource base (resource situation II) would result in large gains to Vietnam's economy in terms of increased income from agriculture and reduction in the trade deficit. This still does not provide a basis for much economic development; a large trade deficit would still remain. Agricultural production deficits would continue. This land resource base would not permit self-sufficiency in both rice and livestock production as of 1980. Production patterns would remain largely unchanged

from those with the existing land resource base; returning the abandoned land would simply ease pressures on rice supplies for human and livestock consumption.

Policies and programs implied by resource situation II are essentially the same as for the existing land resource base. In addition, there would need to be a program which would facilitate the return of people to the land. It is likely, for example, that the previous farm sizes on some of the less productive abandoned land are too small to provide family income large enough to induce resettlement. Some of the abandoned lands are more suitable for crops other than rice; therefore, attention will need to be given to markets for alternative crops.

The land resource base can be expanded (1) by individual farmers increasing their irrigated areas, and (2) by reducing salt water intrusion. Expanding the resource base through farmer-initiated irrigation activities would have beneficial effects, without question. Given more stable conditions, this development is likely to occur over time with little public stimulation. Policies that facilitate the purchase of pumps and other necessary equipment would accelerate the process. As for reducing the impact of salt water intrusion, USDA/AID advisers have provided information on the magnitude of benefits to be expected. However, a determination of the economic feasibility of providing the necessary barriers requires additional information on public capital requirements.

Alteration in the land resource base through additional irrigation and salt water intrusion prevention would affect Vietnam's agriculture largely through extension of traditional production patterns. Agriculture would continue to center around rice production. Thus, policies and programs implied by these situations would be essentially extensions of those associated with the existing resource situation. As rice output increases, there will, of course, be implications involving transportation and marketing and processing facilities.

The greatest potential for agricultural economic development lies in expansion of agriculture onto previously unused land (resource situation V). Addition of the land resources included in the analysis would result in a very large increase in national agricultural income and shift the agricultural trade balance from a large deficit to a large surplus. The addition of large areas of previously unused land would represent a new thrust in terms of production patterns and agricultural institutions. Feed grains, oilseeds, and sugarcane would become major farm enterprises. Several other commodities would also attain increased importance in the economy. Policies and programs relating to method of settlement, farm size, and necessary infrastructure would be required.

The agriculture production/distribution model developed in this USDA/AID project provides a very useful tool for evaluating different sets of economic alternatives. For future use, many and continual improvements in data updating and refinement are vital. The solutions presented in the primary report 3/ are

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3/ Agriculture in the Vietnam Economy, A System for Economic Analysis.  
FDD Field Report 32. Economic Research Service, U.S. Department of Agriculture cooperating with U.S. Agency for International Development and the Vietnam Ministry of Land Reform, Agriculture, Fishery, and Animal Husbandry Development. June 1973.

but a few of the numerous rational assumptions which could be made. Adjustments of many of the economic and/or physical input-output relationships could be made to determine what effect they might have on both the agricultural and nonagricultural sectors.

In formulating future agricultural development strategy, a combination of resources could be defined and the model used to evaluate specified enterprises, prices, processing plant locations, cropping patterns, transportation improvements, capital needs, or other variables as desired.

To operate, update, and adequately interpret results of the model, it is mandatory that an appropriately trained, small staff be developed. All requests for model results would be directed to this staff. The staff would also be responsible for acquiring data, through appropriate agencies, for continual updating and improvement.

Appendix table 1.--Vietnam:

Selected results from maximizing agricultural income under five land resource situations in production/distribution model

Item	Land resource situation 1/				
	I Existing	II Abandoned	III Salt intrusion	IV Irrigation 2/	V Additional
Annual income (net).....	271.6	309.9	317.0	321.4	371.5
Annual foreign trade balance:					
Commodity exports.....	31.9	39.3	42.7	49.0	135.9
Imports.....	133.8	90.4	82.9	82.8	76.6
Commodity.....	(102.7)	(54.7)	(44.9)	(44.1)	(24.6)
Production inputs.....	(31.1)	(35.7)	(38.0)	(38.7)	(52.0)
Net.....	-101.9	-51.1	-40.2	-33.8	59.3
Capital inputs (one-time):					
Production.....	10.1	21.7	26.3	26.5	56.8
Processing and distribution....	16.5	25.6	25.4	27.3	38.0
Foreign exchange needs 3/.....	(14.7)	(29.2)	(31.3)	(32.7)	(94.5)
Total.....	26.6	47.3	51.7	53.8	144.8

1/ The difference between any two adjacent columns indicates the incremental change resulting from moving to the next land resource base.

2/ Small farmer-initiated projects.

3/ Some included under production and some under processing and distribution.



Appendix table 2.--Vietnam: Cropland available under alternative resource situations used in the agricultural production/distribution model 1/

Region	Land resource situation			
	I	II	Salt intrusion (III)	V
	Existing	Abandoned	and minor areas of irrigation (IV)	Additional
	----- 1,000 ha. -----			
Delta (West).....	1,630	1,887	1,908	1,908
Eastern (Delta)....	259	353	373	993
Lower Coastal.....	92	116	116	141
Central Coastal....	178	220	220	263
Northern Coastal...	190	250	250	302
Highlands.....	88	140	140	530
Total.....	2,437	2,966	3,007	4,137

Note: The difference between any two adjacent columns indicates the incremental change resulting from moving to the next land resource situation.

1/ Cadastral area.

Appendix table 3.--Vietnam: New facilities required under five land resource situations

Facilities	Unit capacity <u>1/</u>	Land resource situation				
		I	II	III	IV	V
		Exist- ing	Aban- doned	Salt intrusion	Irriga- tion	Addi- tional
	1,000 M.T.	----- Units -----				
Rice mill.....	10.40	4.3	10.2	4.9	7.3	16.5
Rice drying....	3.00	62.2	64.2	94.0	92.9	118.8
Grain storage..	3.00	147.7	307.1	306.5	335.6	878.5
Thresher- sheller.....	1.00	390.9	535.0	500.1	486.9	1,874.6
Oilseed mill...	57.00	1.3	2.4	2.8	2.8	4.4
Feed mill.....	13.00	12.3	12.1	8.6	8.7	20.0
Sugar refinery:	100.00	--	0.2	0.2	0.2	0.6
Sugar mill.....	450.00	--	--	--	--	6.6
Rubber processing...	1.00	95.1	126.0	126.0	126.0	170.6
Kenaf proc....	2.50	2.6	2.6	2.6	2.6	2.6
Tobacco proc...	10.00	0.5	0.5	0.5	0.5	0.5
Tea processing:	0.25	1.7	1.7	1.7	1.7	1.7

1/ Annual basis.

Appendix table 4.--Vietnam: Agricultural production and grains fed, 1970 and under five alternative resource situations used in agricultural production/distribution model

Crop	Unit	1970	Land resource situation				
			I	II	III	IV	V
			Existing	Historical	Salt intrusion:	Irrigation	Additional
<u>Paddy</u>							
Area.....	1,000 ha.	2,510.7	2,287.4	2,640.2	2,679.5	2,722.0	2,750.7
Production.....	1,000 M.T.	5,715.5	6,434.6	7,244.3	7,559.0	7,736.0	7,736.9
Yield.....	Kgs./ha.	2,280.0	2,810.0	2,740.0	2,820.0	2,840.0	2,810.0
Fed.....	1,000 M.T.	--	366.0	495.9	810.6	810.2	--
<u>Corn</u>							
Area.....	1,000 ha.	28.6	25.2	88.0	63.7	65.2	754.2
Production.....	1,000 M.T.	31.4	57.3	187.5	125.8	128.8	1,855.1
Yield.....	Kgs./ha.	1,100.0	2,270.0	2,130.0	1,970.0	1,980.0	2,460.0
Fed.....	1,000 M.T.	--	30.1	100.9	73.4	76.1	465.1
<u>Sorghum</u>							
Area.....	1,000 ha.	--	290.8	349.8	347.2	336.3	352.6
Production.....	1,000 M.T.	--	402.8	502.0	497.7	482.9	503.7
Yield.....	Kgs./ha.	--	1,380.0	1,440.0	1,430.0	1,440.0	1,430.0
Fed.....	1,000 M.T.	--	267.0	351.4	348.1	333.1	342.1
<u>Soybeans</u>							
Area.....	1,000 ha.	6.8	--	--	--	--	148.7
Production.....	1,000 M.T.	7.5	--	--	--	--	181.6
Yield.....	Kgs./ha.	1,100.0	--	--	--	--	1,220.0
<u>Peanuts</u>							
Area.....	1,000 ha.	30.2	48.8	67.3	95.1	98.8	236.6
Production.....	1,000 M.T.	32.2	86.8	119.0	171.2	175.6	391.8
Yield.....	Kgs./ha.	1,070.0	1,780.0	1,770.0	1,800.0	1,780.0	1,660.0
<u>Jute</u>							
Area.....	1,000 ha.	0.2	11.1	11.1	11.1	11.1	11.1
Production.....	1,000 M.T.	0.2	11.1	11.1	11.1	11.1	11.1
Yield.....	Kgs./ha.	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0
<u>Tobacco</u>							
Area.....	1,000 ha.	8.5	19.1	20.2	20.1	20.4	21.1
Production.....	1,000 M.T.	8.4	25.9	25.9	25.9	25.9	25.9
Yield.....	Kgs./ha.	990.0	1,360.0	1,280.0	1,290.0	1,270.0	1,230.0
<u>Coconut</u>							
Area.....	1,000 Ha.	32.2	--	40.0	40.0	40.0	40.0
Production.....	1,000 M.T.	--	--	480.0	480.0	480.0	480.0
Yield.....	Kgs./ha.	--	--	12,000.0	12,000.0	12,000.0	12,000.0
<u>Rubber</u>							
Area.....	1,000 ha.	1/ 39.2	116.0	140.0	140.0	140.0	174.3
Production.....	1,000 M.T.	33.0	145.5	176.0	176.0	176.0	220.6
Yield.....	Kgs./ha.	840.0	1,250.0	1,260.0	1,260.0	1,260.0	1,260.0

1/ Area planted to rubber was 105,800 hectares; 39,240 hectares were tapped.

Continued

Appendix table 4.--Vietnam: Agricultural production and grains fed, 1970 and under five alternative resource situations used in agricultural production/distribution model--continued

Crop	Unit	1970	Land resource situation					Additional
			Irrigation					
			I	II	III	IV	V	
			Existing	Historical	Salt intrusion			
<u>Coffee</u>								
Area.....	1,000 ha.	9.4	7.0	7.0	7.0	7.0	48.6	
Production.....	1,000 M.T.	3.9	8.4	8.4	8.4	8.4	50.5	
Yield.....	Kgs./ha.	410.0	1,200.0	1,200.0	1,200.0	1,200.0	1,040.0	
<u>Pineapple</u>								
Area.....	1,000 ha.	4.5	--	--	10.0	10.0	10.0	
Production.....	1,000 M.T.	33.3	--	--	80.0	80.0	80.0	
Yield.....	Kgs./ha.	7,400.0	--	--	8,000.0	8,000.0	8,000.0	
<u>Tea</u>								
Area.....	1,000 ha.	8.2	7.3	7.2	7.2	7.2	7.5	
Production.....	1,000 M.T.	5.5	5.9	6.4	6.4	6.4	6.6	
Yield.....	Kgs./ha.	670.0	810.0	890.0	890.0	890.0	880.0	

Appendix table 5.--Vietnam: Agricultural exports and imports, 1970 and under five alternative resource situations used in the agricultural production/distribution model

Crop	1970	Land resource situation					V
		I	II	III	IV	Additional	
		Existing	Abandoned	Salt intrusion	Irrigation		
				1,000 M.T.			
Rice							
Exports.....	--	--	--	--	96.8	539.2	--
Imports.....	386.2	--	--	--	--	--	--
Flour							
Exports.....	--	--	--	--	--	--	--
Imports.....	199.0	107.1	107.1	107.1	107.1	107.1	--
Wheat							
Exports.....	--	--	--	--	--	--	--
Imports.....	--	185.9	185.9	185.9	185.9	185.9	--
Corn							
Exports.....	--	--	--	--	--	--	--
Imports.....	116.6	61.4	--	--	--	1,053.9	--
Sorghum							
Exports.....	--	--	--	--	--	87.1	--
Imports.....	--	--	--	--	--	--	--
Copra							
Exports.....	--	--	28.9	53.3	53.3	53.5	--
Imports.....	--	--	--	--	--	--	--
Peanuts							
Exports.....	--	--	--	--	--	107.9	--
Imports.....	--	--	--	--	--	--	--
Soybeans							
Exports.....	--	--	--	--	--	165.1	--
Imports.....	14.5	--	--	--	--	--	--
Peanut Oil							
Exports.....	--	--	--	--	1.8	30.1	--
Imports.....	--	--	--	--	--	--	--
Soybean Oil							
Exports.....	--	--	--	--	--	--	--
Imports.....	18.1	24.0	--	--	--	--	--
Soybean Meal							
Exports.....	--	--	--	--	--	--	--
Imports.....	--	48.5	39.5	12.8	11.6	--	--

Continued



Appendix table 5.--Vietnam: Agricultural exports and imports, 1970 and under five alternative resource situations used in the agricultural production/distribution model--continued

Crop	1970	Land resource situation					V
		I	II	III	IV		
		Existing	Abandoned	Salt intrusion	Irrigation	Additional	
				1,000 M.T.			
Bananas							
Exports.....	--	200.0	200.0	200.0	200.0	200.0	200.0
Imports.....	--	--	--	--	--	--	--
Rubber (Raw)							
Exports.....	23.6	137.4	167.9	167.9	167.9	212.5	212.5
Imports.....	--	--	--	--	--	--	--
Cotton							
Exports.....	--	--	--	--	--	--	--
Imports.....	28.6	39.4	39.4	39.4	39.4	39.4	39.4
Duck Feathers							
Exports.....	0.3	0.9	0.9	0.9	0.9	0.9	0.9
Imports.....	--	--	--	--	--	--	--
Raw Sugar							
Exports.....	--	--	--	--	--	--	--
Imports.....	--	286.6	286.6	273.4	259.0	--	--
Sugar							
Exports.....	--	--	--	--	--	--	--
Imports.....	102.3	118.6	99.2	99.2	99.2	53.6	53.6
Coffee							
Exports.....	--	2.7	2.7	2.7	2.7	44.9	44.9
Imports.....	--	--	--	--	--	--	--
Pineapples							
Exports.....	--	--	--	80.0	80.0	80.0	80.0
Imports.....	--	--	--	--	--	--	--
Pork							
Exports.....	--	--	--	2.0	5.0	5.0	5.0
Imports.....	--	67.4	17.8	--	--	--	--
Chicken							
Exports.....	--	--	--	--	--	--	--
Imports.....	--	5.8	5.8	--	--	--	--
Beef							
Exports.....	--	--	--	--	--	--	--
Imports.....	--	18.3	14.4	13.8	13.7	2.8	2.8









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